Claims

[1] 1. An apparatus for cutting a glass plate, comprising a cracking means for forming a minute crack at a point on the glass plate where the cutting is started, at least one scribing means using a laser beam absorbed by the glass plate, at least one quenching means using a quenching fluid after irradiation of the laser beam, a breaking means using the laser beam, the breaking means comprising a laser oscillator, a reflection mirror and a focusing lens,
wherein the focusing lens has at least two or more focal lengths.

[2] 2. The apparatus as set forth in claim 1, wherein the focusing lens has a focal length at a center of the lens longer than that at an outer portion of the lens.

[3] 3. The apparatus as set forth in claim 1 or 2, wherein the focusing lens has at least two or more focal lengths and has a cylindrical shape such that the focusing lens is located for the laser beam to be symmetrically irradiated in the lengthwise direction of the scribe line created by the scribing means.

[4] 4. The apparatus as set forth in claim 3, wherein the focusing lens comprises a cylindrical Plano-convex type lens with a flat shaped bottom, an Aspheric type lens with a crown-shaped convex bottom, or a cylindrical Bi-convex type lens.

[5] 5. An apparatus for cutting a glass plate, comprising a cracking means for forming a minute crack at a point on the glass plate where the cutting is started, at least one scribing means using a laser beam absorbed by the glass plate, at least one quenching means using a quenching fluid after irradiation of the laser beam, a breaking means using the laser beam, the breaking means comprising a laser oscillator, a reflection mirror and a focusing lens, the apparatus further comprising:
a photo mask formed with light transmission openings for transmitting a part of the laser beam to be irradiated on the glass plate instead of the focusing lens.

[6] 6. The apparatus as set forth in claim 5, wherein the light transmission openings are symmetrically arranged for the scribe line.

[7] 7. The apparatus as set forth in claim 5, wherein the light transmission openings are symmetrically arranged for the scribe line and at the same time formed for the laser beam to be split perpendicular to the scribe line.